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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/623,191	SNOEREN ET AL.	
	Examiner	**Art Unit**	
	David P. Rashid	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,4,6-17,19-30 and 32-40* is/are rejected.

7)☒ Claim(s) *5,18 and 31* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *7/18/2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

All of the examiner's suggestions presented herein below have been assumed for examination purposes, unless otherwise noted.

Amendments

1. This office action is responsive to the claim and specification amendment received on 10/31/2007. **Claims 1** and **2-40** remain pending.

Drawings

2. The replacement drawings were received on 10/31/2007 and are acceptable. In response to applicant's drawing amendments and remarks, the previous drawing objections are withdrawn.

Specification

3. The following is a quote from 37 CFR 1.72:

> (b) A brief abstract of the technical disclosure in the specification must commence on a separate sheet, preferably following the claims, under the heading "Abstract " or "Abstract of the Disclosure. " The sheet or sheets presenting the abstract may not include other parts of the application or other material. The abstract in an application filed under 35 U.S.C. 111 may not exceed 150 words in length. The purpose of the abstract is to enable the United States Patent and Trademark Office and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure.

4. The abstract is objected to under 37 CFR 1.72 for the following reasons:

The abstract includes the title of the invention on the same sheet. The sheet(s) presenting the abstract may not include other parts of the application or other material – it is suggested to remove the title of the invention from the abstract sheet.

Claim Objections

5. The following is a quotation of 37 CFR 1.75(a):

> The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

6. **Claims 5, 18,** and **31** are objected to under 37 CFR 1.75(a), as failing to conform to particularly point out and distinctly claim the subject matter which application regards as his invention or discovery.

7. The claims cite "wherein each of the first and second medical image is selected from a digitized analog image and a digitally acquired image" but it is unclear whether

(i) the first image is a digitized analog image and the second image is a digitally acquired image;

(ii) the first and second image could either be a digitized analog image or a digitally acquired image;

(iii) one image must be a digitized analog image and the other image must be a digitally acquired image; or

(iv) any other possible combination.

Claim Rejections - 35 USC § 101

8. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

> Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.
>
> When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare In re Lowry, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and Warmerdam, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).
>
> In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

9. **Claims 39** and **40** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 39 and 40 define a "computer program product embodied on a computer-readable medium for directing a computing apparatus" embodying functional descriptive material. However, the claim does not define a computer-readable medium or memory and is thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). That is, the scope of the presently claimed "computer program product embodied on a computer-readable medium for directing a computing apparatus" can range from paper on

which the program is written, to a program simply contemplated and memorized by a person. The examiner suggests amending the claim as follows:

"A computer readable medium embodied with a computer program product such that when executed direct a computing apparatus to automatically register a first medical image and a second medical image, comprising:"

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. **Claims 1, 3-4, 6-12, 14-17, 19-25, 27-30, 32-37,** and **39-40** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination between Giger et al. (US 5,133,020 A) and Doi et al. (US 5,224,177 A).

Regarding **claim 1**, while Giger discloses a method for grayscale registration (FIG. 7, "[m]ethod 4" in Col. 3, lines 47 - 49) of a first medical image (FIG. 7, element 530) and a second medical image (FIG. 7, element 520), comprising the steps of:

spatially registering the first medical image and the second medical image relative to each other (FIG. 2, elements 120, 130); and

generating at least one joint pixel value histogram ("<u>In methods 3 (FIG. 6) and 4 (FIG. 7)</u>, bilateral subtraction is performed after gray-level thresholding of the individual original images. <u>This gray-level thresholding can be performed with or without prior application of cumulative histogram matching (described earlier).</u>", in Col. 6, lines 25 - 33) based on pixel

values of the first and second medical images (FIG. 2, element 140; FIG. 7, elements 530, 540), Giger does not teach

generating a lookup table based at least in part on the at least one joint pixel value histogram, a first image acquisition method for the first medical image and a second image acquisition method for the second medical image; and

applying the lookup table to the pixel values of the first medical image to generate a third medical image, the third medical image being transformed from the first medical image and registered to the second medical image.

Doi et al. discloses a high quality film image correction and duplication method (FIG. 7) generating a lookup table (FIG. 4; Col. 2, lines 23 –25; "(c) look-up table for density correction" in FIG. 3) based at least in part on the at least one pixel value histogram ("determination of gray-level histogram" and "determination of minimum pixel value (corresponding to maximum density) and pixel value at 25% fraction" in FIG. 7; FIG. 5), a first image acquisition method for the first image and a second image acquisition method for the second image; and

applying the lookup table to the pixel values of the first image to generate a third image (image created from "corrected pixel value" in FIG. 3), the third image being transformed from the first image (image created from "original pixel value" in FIG. 3) and registered to the second image (The third medical image would already be registered to the second medical image since the histogram of Giger would have been produced (FIG. 2, elements 140; FIG. 7) after the registration (FIG. 2, elements 120, 130).).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for

the method of Giger to generate a lookup table based at least in part on the at least one pixel value histogram, a first image acquisition method for the first medical image and a second image acquisition method for the second medical image; and applying the lookup table to the pixel values of the first medical image to generate a third medical image, the third medical image being transformed from the first medical image as taught by Doi to "...(1) improve the image quality of duplicated images including non-linearities requiring correction; (2) recover improperly exposed radiographs; (3) enhance conventional radiographs using digital processing; and (4) use a digitizer as a front-end device for a picture archiving and communication system (PACS) and for computer-aided diagnosis (CAD).", Doi, Col. 1, lines 39 – 46 AND

for the pixel value histogram (generating the lookup table) of Giger in view of Doi to be a joint pixel value histogram as taught by Giger " to provide a method and system for matching the gray-level frequency-distributions of two or more images by matching the cumulative gray-level histograms of the images in question.", Giger, Col. 2, lines 49-54 and "that this technique of matching the cumulative gray-level histograms of two or more images can be applied, in general, in many applications such as image processing for human vision and/or computer vision. For example, images from multiple CT (computed tomography) slices or images obtained at different times could be matched with respect to density using this technique.", Giger, Col. 6, lines 18-25.

Regarding **claim 3**, while Giger in view of Doi discloses the method of claim 1, Giger in view of Doi does not teach the step of generating the lookup table to include:

selecting a parametric transform function from a plurality of predetermined, parametric transform functions based on the first and second medical image acquisition methods for the first and second medical images, respectively; and

statistically fitting parameters of the selected parametric transform function to the at least one pixel value histogram, the statistically fitting determines values of the parameters, wherein the lookup table is generated using the selected parametric transform function and the values of the fitted parameters.

Doi et al. discloses a high quality film image correction and duplication method (FIG. 7) wherein the step of generating a lookup table includes:

selecting a parametric transform function from a plurality of predetermined, parametric transform functions ("selection of optimal look-up table" in FIG. 7; Col. 6, lines 53 – 55; center line in FIG. 3) based on the first and second medical image acquisition methods for the first and second medical images, respectively (refer to arguments/references cited in claim 1); and

statistically fitting parameters ("over-exposure level: 4.0x, 2.8x, 2.0x, 1.4x" and "under-exposure level: 1/4.0, 1/2.8, 1/2.0, 1/1.4" in FIG. 4 each defining a different correction curve in combination with determining one of these correct parametric transform functions using the (i) the pixel value at 25% fraction and (ii) minimum pixel value as shown in FIG. 6A, FIG. 5 (further detail in Col. 5, lines 3 – 25)) of the selected parametric transform function to the at least one pixel value histogram ("histogram of input data" in FIG. 2; the change in FIG. 3C from the look-up table will also ultimately change the histogram), the statistically fitting determines values of the parameters (Col. 5, lines 11 - 19), wherein the lookup table is generated using the selected parametric transform function and the values of the fitted parameters (FIG. 4; Col. 5, lines 3 – 25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the lookup table of Giger in view of Doi to include selecting a parametric transform function from a plurality of predetermined, parametric transform functions based on

the first and second medical image acquisition methods for the first and second medical images, respectively; and statistically fitting parameters of the selected parametric transform function to the at least one pixel value histogram, the statistically fitting determines values of the parameters, wherein the lookup table is generated using the selected parametric transform function and the values of the fitted parameters as taught by Doi to "...(1) improve the image quality of duplicated images including non-linearities requiring correction; (2) recover improperly exposed radiographs; (3) enhance conventional radiographs using digital processing; and (4) use a digitizer as a front-end device for a picture archiving and communication system (PACS) and for computer-aided diagnosis (CAD).", Doi, Col. 1, lines 39 – 46.

Regarding **claim 4**, while Giger in view of Doi discloses the method of claim 3, Giger in view of Doi does not teach wherein the plurality of predetermined parametric transform functions are one-dimensional monotonic functions.

Doi et al. discloses a high quality film image correction and duplication method (FIG. 7) wherein the plurality of predetermined parametric transform functions are one-dimensional monotonic functions (FIG. 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the plurality of predetermined parametric transform functions of Giger in view of Doi to be one-dimensional monotonic functions as taught by Doi to employ "...a nonlinear density-correction technique based on the H & D curve otherwise known as the characteristic curve of the original radiographic films (Kodak OC film with Lanex Medium screens).", Col 3. lines 35 - 39.

Regarding **claim 6**, while Giger in view of Doi disclose the method of claim 3, Giger in view of Doi does not teach wherein each of the plurality of predetermined parametric transform

functions models image acquisition parameters, the image acquisition parameters being at least one of incident radiation intensity, exposure time, film characteristic curve for an analog image, digitizer characteristic for digitizing an analog image, and digital detector response for a digitally acquired image.

Doi et al. discloses a high quality film image correction and duplication method (FIG. 7) wherein each of the plurality of predetermined parametric transform functions models image acquisition parameters, the image acquisition parameters being at least one of incident radiation intensity, exposure time (exposure time correction curves in FIG. 4), film characteristic curve for an analog image, digitizer characteristic for digitizing an analog image, and digital detector response for a digitally acquired image.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for each of the plurality of predetermined parametric transform functions Giger in view of Doi to model image acquisition parameters, the image acquisition parameters being at least one of incident radiation intensity, exposure time, film characteristic curve for an analog image, digitizer characteristic for digitizing an analog image, and digital detector response for a digitally acquired image as taught by Doi since "...improperly exposed radiographs can be recovered by using digital image processing techniques.", Col., lines 27 – 29.

Regarding **claim 7**, while Giger in view of Doi disclose the method of claim 3, wherein each of the first and second medical images is a mammogram (FIG. 5; Col. 3, lines 37 - 38), Giger in view of Doi does not teach wherein each of the first and second medical images is a mammogram, and wherein each of the plurality of predetermined parametric transform functions models image acquisition parameters, the image acquisition parameters being at least one of breast thickness, incident radiation intensity, exposure time, film characteristic curve for

an analog image, digitizer characteristic for digitizing an analog image, and digital detector response for a digitally acquired image.

Doi et al. discloses a high quality film image correction and duplication method (FIG. 7) wherein each of the plurality of predetermined parametric transform functions models image acquisition parameters, the image acquisition parameters being at least one of incident radiation intensity, exposure time (exposure time correction curves in FIG. 4), film characteristic curve for an analog image, digitizer characteristic for digitizing an analog image, and digital detector response for a digitally acquired image.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for each of the plurality of predetermined parametric transform functions Giger in view of Doi to model image acquisition parameters, the image acquisition parameters being at least one of incident radiation intensity, exposure time, film characteristic curve for an analog image, digitizer characteristic for digitizing an analog image, and digital detector response for a digitally acquired image as taught by Doi since "...improperly exposed radiographs can be recovered by using digital image processing techniques.", Col., lines 27 – 29.

Regarding **claim 8**, Giger in view of Doi discloses method of claim 1, wherein Giger further comprises the steps of:

performing computer aided detection process (FIG. 7, element 590; FIG. 18, element 1140) for comparing the second (FIG. 7, element 520) and third (FIG. 7, element 510 wherein the modified element 510 has already undergone transformation as taught by Doi (refer to claim 3)) medical images; and

displaying the second and third medical images with results of the computer aided detection process (FIG. 18, element 1165).

Regarding **claim 9**, Giger in view of Doi discloses the method of claim 1, wherein Giger spatially registering (FIG. 2, elements 120, 130) the first (FIG. 7, element 530) and second (FIG. 7, element 520) medical images includes at least one of translating, rotating, shearing and scaling at least one of the first and second medical images (Col. 5, lines 12 - 24).

Regarding **claim 10**, Giger in view of Doi discloses the method of claim 1, wherein Giger each of the first (FIG. 7, element 530) and second (FIG. 7, element 520) medical images includes a target portion ("boundary" in Col. 5, lines 12 – 24; FIG. 13) and a remainder portion (remaining image that is not the boundary) and wherein spatially registering (FIG. 2, elements 120, 130) the first and second medical images includes segmenting the target portion and the remainder portion of each of the first and second medical images (If the boundary has been recognized in each image, the images have been "segmented" to either boundary or non-boundary portions.).

Regarding **claim 11**, Giger in view of Doi discloses the method of claim 1, wherein Giger each of the first (FIG. 7, element 530) and second (FIG. 7, element 520) medical images includes a target portion (Col. 5, lines 12 – 24; FIG. 13; portion of image 1 to not be removed when translated to align with image 2) and a remainder portion (portion of image 1 to be removed when translated to align with image 2) and wherein spatially registering (FIG. 2, elements 120, 130; Col. 5, lines 12 – 24; FIG. 13) the first and second medical images includes cropping each of the first and second medical images to contain only the target portion that is in both the first and second medical images (Cropping must occur on the "TV camera digitizer" in Col. 5, lines 12 – 24 since there exists a limited amount of area for image 1 and image 2 to align. A portion image 1 must be eliminated when translated to align with the image 2. If

image 1 and 2 are both translated to align with each other, then both must eliminate a portion of their image when translating.).

Regarding **claim 12**, Giger in view of Doi discloses the method of claim 11, wherein Giger the at least one pixel value histogram (FIG. 2, element 140) is generated based on pixel values of only the cropped first and second medical images (Col. 7, lines 45 – 54).

Regarding **claim 14**, while Giger discloses a method for registering (FIG. 7; "[m]ethod 4" in Col. 3, lines 47 - 49) a first medical image (FIG. 7, element 530) to a second medical image (FIG. 7, element 520), comprising the steps of:

generating a joint pixel value histogram (FIG. 5; Col. 6, lines 25 - 31) using pixel values of the first and second medical images, Giger does not teach

selecting a parametric transform function from a plurality of predetermined parametric transform functions, the selecting being based on a first medical image acquisition method for the first medical image and a second medical image acquisition method for the second medical image; and

statistically fitting parameters of the selected parametric transform function to the joint pixel value histogram, the statistically fitting determines values of the parameters.

Doi et al. discloses a high quality film image correction and duplication method (FIG. 7)

selecting a parametric transform function from a plurality of predetermined parametric transform functions ("selection of optimal look-up table" in FIG. 7; Col. 6, lines 53 - 55), the selecting being based on a first medical image acquisition method for the first image and a second image acquisition method for the second image; and

statistically fitting parameters ("over-exposure level: 4.0x, 2.8x, 2.0x, 1.4x" and "under-exposure level: 1/4.0, 1/2.8, 1/2.0, 1/1.4" in FIG. 4 each defining a different correction curve in

combination with determining one of these correct parametric transform functions using the (i) the pixel value at 25% fraction and (ii) minimum pixel value as shown in FIG. 6A, FIG. 5 (further detail in Col. 5, lines 3 – 25)) of the selected parametric transform function (Col. 5, lines 11 - 19) to the joint pixel value histogram ("histogram of resulting images" in FIG. 2; image created from "original pixel value" to image create from "corrected pixel value" in FIG. 3C that would alter the joint pixel value histogram produced by Giger) after the registration (FIG. 2, elements 120, 130 of Giger)), the statistically fitting determines values of the parameters (Col. 5, lines 11 - 19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Giger in view of Doi to include selecting a parametric transform function from a plurality of predetermined parametric transform functions, the selecting being based on a first medical image acquisition method for the first medical image and a second medical image acquisition method for the second medical image; and statistically fitting parameters of the selected parametric transform function to the joint pixel value histogram, the statistically fitting determines values of the parameters as taught by Doi to "...(1) improve the image quality of duplicated images including non-linearities requiring correction; (2) recover improperly exposed radiographs; (3) enhance conventional radiographs using digital processing; and (4) use a digitizer as a front-end device for a picture archiving and communication system (PACS) and for computer-aided diagnosis (CAD).", Doi, Col. 1, lines 39 – 46.

Regarding **claim 15**, claim 1 recites identical features as in claim 15. Thus, references/arguments equivalent to those presented above for claim 1 is equally applicable to claim 15.

Regarding **claim 16**, claim 8 recites identical features as in claim 16. Thus, references/arguments equivalent to those presented above for claim 8 is equally applicable to claim 16.

Regarding **claim 17**, claim 4 recites identical features as in claim 17. Thus, references/arguments equivalent to those presented above for claim 4 is equally applicable to claim 17.

Regarding **claim 19**, claim 6 recites identical features as in claim 19. Thus, references/arguments equivalent to those presented above for claim 6 is equally applicable to claim 19.

Regarding **claim 20**, claim 7 recites identical features as in claim 20. Thus, references/arguments equivalent to those presented above for claim 7 is equally applicable to claim 20.

Regarding **claim 21**, claim 1 recites identical features as in claim 21. Thus, references/arguments equivalent to those presented above for claim 1 is equally applicable to claim 21.

Regarding **claim 22**, claim 9 recites identical features as in claim 22. Thus, references/arguments equivalent to those presented above for claim 9 is equally applicable to claim 22.

Regarding **claim 23**, claim 10 recites identical features as in claim 23. Thus, references/arguments equivalent to those presented above for claim 10 is equally applicable to claim 23.

Regarding **claim 24**, claim 11 recites identical features as in claim 24. Thus, references/arguments equivalent to those presented above for claim 11 is equally applicable to claim 24.

Regarding **claim 25**, claim 12 recites identical features as in claim 25. Thus, references/arguments equivalent to those presented above for claim 12 is equally applicable to claim 25.

Regarding **claim 27**, while Giger discloses a system (FIG. 2; FIG. 7; "[m]ethod 4" in Col. 3, lines 47 - 49) for registering a first medical image (FIG. 7, element 530) to a second (FIG. 7, element 520) medical image, comprising:

an input (Col. 5, lines 9 - 18) for receiving data for the first (FIG. 7, element 530) and second (FIG. 7, element 520) medical images; and

a processor (Col. 9, lines 11 - 17) configured to generate a joint pixel value histogram (FIG. 5; Col. 6, lines 25 - 31) using pixel values of the first and second medical images, Giger does not teach selecting a parametric transform function from a plurality of predetermined parametric transform functions based on a first image acquisition method for the first medical image and a second image acquisition method for the second medical image, and statistically fit parameters of the selected parametric transform function to the joint histogram to determine the values of the parameters.

Doi et al. discloses a high quality film image correction and duplication method (FIG. 7) selecting a parametric transform function (Col. 5, lines 11 - 19) from a plurality of predetermined parametric transform functions ("selection of optimal look-up table" in FIG. 7; Col. 6, lines 53 - 55) based on a first image acquisition method for the first medical image and a second image acquisition method for the second medical image, and statistically fit parameters

("over-exposure level: 4.0x, 2.8x, 2.0x, 1.4x" and "under-exposure level: 1/4.0, 1/2.8, 1/2.0, 1/1.4" in FIG. 4 each defining a different correction curve in combination with determining one of these correct parametric transform functions using the (i) the pixel value at 25% fraction and (ii) minimum pixel value as shown in FIG. 6A, FIG. 5 (further detail in Col. 5, lines 3 – 25)) of the selected parametric transform function to the joint histogram to determine the values of the parameters (Col. 5, lines 11 – 19; selection of the parametric transform function based off of using the (i) the pixel value at 25% fraction and (ii) minimum pixel value as shown in FIG. 6A, FIG. 5 (further detail in Col. 5, lines 3 – 25)).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Giger in view of Doi to include selecting a parametric transform function from a plurality of predetermined parametric transform functions based on a first image acquisition method for the first medical image and a second image acquisition method for the second medical image, and statistically fit parameters of the selected parametric transform function to the joint histogram to determine the values of the parameters as taught by Doi to "...(1) improve the image quality of duplicated images including non-linearities requiring correction; (2) recover improperly exposed radiographs; (3) enhance conventional radiographs using digital processing; and (4) use a digitizer as a front-end device for a picture archiving and communication system (PACS) and for computer-aided diagnosis (CAD).", Doi, Col. 1, lines 39 – 46.

Regarding **claim 28**, claim 1 recites identical features as in claim 28. Thus, references/arguments equivalent to those presented above for claim 1 is equally applicable to claim 28.

Regarding **claim 29**, claim 8 recites identical features as in claim 29. Thus, references/arguments equivalent to those presented above for claim 8 is equally applicable to claim 289.

Regarding **claim 30**, claim 4 recites identical features as in claim 30. Thus, references/arguments equivalent to those presented above for claim 4 is equally applicable to claim 30.

Regarding **claim 32**, claim 6 recites identical features as in claim 32. Thus, references/arguments equivalent to those presented above for claim 6 is equally applicable to claim 32.

Regarding **claim 33**, claim 1 recites identical features as in claim 33. Thus, references/arguments equivalent to those presented above for claim 1 is equally applicable to claim 33.

Regarding **claim 34**, claim 9 recites identical features as in claim 34. Thus, references/arguments equivalent to those presented above for claim 9 is equally applicable to claim 34.

Regarding **claim 35**, claim 10 recites identical features as in claim 35. Thus, references/arguments equivalent to those presented above for claim 10 is equally applicable to claim 35.

Regarding **claim 36**, claim 11 recites identical features as in claim 36. Thus, references/arguments equivalent to those presented above for claim 11 is equally applicable to claim 36.

Regarding **claim 37**, claim 12 recites identical features as in claim 37. Thus, references/arguments equivalent to those presented above for claim 12 is equally applicable to claim 37.

Regarding **claim 39**, claim 14 recites identical features as to the computer program product for directing a computing apparatus (Col. 9, lines 11 - 17) in claim 39. Thus, references/arguments equivalent to those presented above for claim 14 is equally applicable to claim 39.

Regarding **claim 40**, claim 1 recites identical features as to the computer program product for directing a computing apparatus (Col. 9, lines 11 - 17) in claim 40. Thus, references/arguments equivalent to those presented above for claim 1 is equally applicable to claim 40.

12. **Claims 13, 26,** and **38** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination between Giger et al. (US 5,133,020 A) and Doi et al. (US 5,224,177 A), in further view of Brecher et al. (US 5,544,256 A).

Regarding **claim 13**, while Giger in view of Doi discloses an alignment and correlation of the images (FIG. 2, elements 120, 130) in the method of claim 1, Giger in view of Doi does not teach spatially registering the first and second medical images includes optimization of an entropy correlation coefficient of the first and second medical images.

Brecher discloses an automated defect classification system (FIG. 1) wherein its reference image and input image includes optimization of an entropy correlation coefficient for spatially registering (FIG. 4, element 19; Col. 8, lines 36 – 40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the spatially registering of Giger in view of Doi to use optimization of an entropy correlation coefficient of the first and second image as taught by Brecherto to select the maximum correlation between two images when translating one image about the other for the best-fit alignment.

Regarding **claim 26**, claim 13 recites identical features as in claim 26. Thus, references/arguments equivalent to those presented above for claim 13 is equally applicable to claim 26.

Regarding **claim 38**, claim 13 recites identical features as in claim 38. Thus, references/arguments equivalent to those presented above for claim 13 is equally applicable to claim 38.

Allowable Subject Matter

13. **Claims 5, 18,** and **31** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 5, 18, and 31, while the prior art teaches where each of the first and second medical image is selected from a digitized analog image and a digitally acquired image including a plurality of predetermined parametric transform functions, the prior art does not teach wherein the plurality of predetermined parametric transform functions includes: (1) a function for registering a digitized analog image to another digitized analog image, (2) a function for registering a digitally acquired image to another digitally acquired image, (3) a

function for registering a digitally acquired image to a digitized analog image, and (4) a function for registering a digitized analog image to a digitally acquired image.

Response to Arguments

15. Applicant's arguments filed on 10/31/2007 with respect to **Claims 1** and **2-40** have been respectfully and fully considered, but they are not found persuasive.

16. **Summary of Remarks** regarding **claims 1, 14, 27,** and **39-40:**

(i) Application argues with respect to claim 2, the Examiner relies on Giger as teaching generating a joint pixel value histogram of the first and second medical images, citing elements 520 and 530 of FIG. 7. However, as clearly shown in FIG. 7, a separate histogram is generated tbr each image (generating a histogram 530 of the left image 510 and generating a histogram 540 of the right image 520). In addition, as explicitly states in Giger, "gray-level histograms are then obtained for each image," referring to steps 530 and 540 of FIG. 7. (Col. 6, lines 37-38) (@ *response pages 14-15*).

Independent claims 14, 27, 39 and 40 similarly recite the generation of a joint pixel value histogram based on pixel values of the first and second medical images. The arguments above similarly apply to independent claims 14, 27, 39 and 40 (@ *response page 15*).

(ii) Application argues neither Giger nor Doi, alone or in combination, discloses or suggests the generation of a *joint* pixel value histogram based on pixel values of the first and second medical images (@ *response pages 15-16*).

Withdrawal of the rejection of independent claims 1, 14, 27, 39 and 40 as well as claims dependent therefrom under 35 I_LS.C. § 103(a) is respectfully requested (@ *response page 16*).

17. **Examiner's Response** regarding **claims 1, 14, 27,** and **39-40:**

(i) However, thought Giger does according to methods 3 and 4 create separate histograms for each left and right image, Giger does in fact state in Col. 6, lines 25 – 33 "[i]n methods 3 (FIG. 6) and 4 (FIG. 7), bilateral subtraction is performed after gray-level thresholding of the individual original images. This gray-level thresholding can be performed with or without prior application of cumulative histogram matching (described earlier)." The cumulative histogram is as shown in FIG. 4 of Giger where both the left and right images are added together to form a histogram. The Examiner's argument above similarly apply to independent claims 14, 27, 39 and 40

(ii) However, though Doi discloses using a single pixel value histogram, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the pixel value histogram (generating the lookup table) of Giger in view of Doi to be a joint pixel value histogram as taught by Giger " to provide a method and system for matching the gray-level frequency-distributions of two or more images by matching the cumulative gray-level histograms of the images in question.", Giger, Col. 2, lines 49-54 and "that this technique of matching the cumulative gray-level histograms of two or more images can be applied, in general, in many applications such as image processing for human vision and/or computer vision. For example, images from multiple CT (computed tomography) slices or images obtained at different times could be matched with respect to density using this technique.", Giger, Col. 6, lines 18-25.

18. **Summary of Remarks** regarding **claims 13, 26,** and **38:**

Applicant argues dependent claims 13, 26, and 38 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Giger and Doi in further view of Brecher. However,

dependent claims 13, 26, and 38 are believed to be allowable at least because the independent claims 1, 14, and 27 from which they variously depend are allowable as discussed above (@ *response page 16*).

19. **Examiner's Response** regarding **claims 13, 26,** and **38:**

However, dependent claims 13, 26, and 38 are not allowable at least because the independent claims 1, 14, and 27 from which they variously depend are allowable as discussed above.

Conclusion

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 5481480 A; US 5657362 A; and US 5537485 A.

21. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David P. Rashid whose telephone number is (571) 270-1578. The examiner can normally be reached Monday - Friday 8:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P. Rashid/
Examiner, Art Unit 2624

David P Rashid
Examiner
Art Unit 2624

VIKKRAM BALI
PRIMARY EXAMINER